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ABSTRACT

A study of methods for protecting the special collection at the University of Abilene (Texas) from fading and deterioration caused by ultraviolet (UV) rays showed that fluorescent light filters did not correct the problem. Leaders in the preservation field say that the removal of light is the best procedure to eliminate fading. A second choice is to use tungsten lighting, and a third is to use filters to keep the lux meter reading of ultraviolet rays between 60 and 80. (4 references) (KRN)

Protecting Libraries for Lifelong Learning

by

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Protecting Libraries for Lifelong Learning

One of the standards for ethical conduct for rare book, manuscripts, and special collections libraries given in C & RL News March, 1987, is a guideline for preservation: "Rare book, manuscript, and special collections librarians shall protect the physical integrity of the materials in their custody, guarding them against defacement, alterations and physical damage."[1]

This guideline indicates that the physical creation of a collection carries with it the mandate that the materials will be protected from environmental problems as much as is economically possible.

On the first row of shelving in Callie Faye Milliken Special Collections is a row of brown-spined volumes. The exposed edges are cracking; head bands are worn and tearing off. I removed one of the decaying volumes from the shelf and found a green leather bound volume of the 11th edition of Encyclopedia Britannica published by Cambridge University Press in 1911. I brought one for you to see today. The India paper is white and strong; the black ink is very readable. The cover is attached and maintains the beautiful green polished appearance of a well-cared-for book, except for the spine.

It has been attacked by ultraviolet light. The original damage likely came from direct sunlight, the most damaging of

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[1]"Standards for Ethical Conduct for Rare Books, Manuscripts, and Special Collections Librarians," C & RL News (March, 1987) : 134 - 135.

ultraviolet rays; and six years of fluorescent lighting in Special Collections has taken its toll as well.

Another indication of the need to study fluorescent lighting was provided when the Special Collections personnel used the conservation survey for libraries published by North Eastern Document Conservation Center as an instrument to determine the conservation needs in the collection. I have a copy with me today if you would like to see it. One of the stated objectives of the survey is to find out what damage is happening to the collection and what can be done to prevent further destruction.

Questions on lighting included: "How is sunlight entering the building controlled to minimize intensity and remove ultra-violet radiation?" and "If fluorescent lights are in use, are they screened to filter out the ultra-violet energy radiated by fluorescent tubes?"[2] The first question I could answer "yes." Light in the collection is controlled with tinted, insulated glass from the adjacent atrium as well as the outside corner windows. The second answer was "no". Unshielded fluorescent lights burn in Special Collections/Archives from 8 - 5 weekdays. The collection is not opened at other times.

The problem of the brown rotting spines on the 1911 Encyclopedia Britannica added to the charge in the professional code of ethics and the conservation survey started this pursuit of

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[2]Barbara Cohen-Stratyner and Brigitte Kueppers, ed., Preserving America's Performing Arts: Papers from the Conference on Preservation Management for Performing Arts Collections (Washington, D. C. : The Theatre Library Association, 1982), 125 - 127.

how to best protect the historical and intrinsically significant book collection in Callie Faye Milliken Special Collections/Abilene Christian University Archives. My hope was to find a solution for the fading and deterioration caused by UV rays falling on the exposed surfaces of commercial and house-bound volumes.

What are ultraviolet rays? Sunlight and fluorescent lighting emit both visible light and invisible ultraviolet radiation, commonly called UV. UV is the short-wavelength side of visible light. Because short wavelengths have higher energy, they are more damaging than long wavelengths. These rays cause most weakening and yellowing of paper and other organic materials, derived from plants such as paper, cotton, and linen, as well as materials from animals, e. g. wool and leather. Because it damages materials and does not affect vision UV should be filtered as much as possible. We tested three kinds of UV filters: a rigid UV Shield, a thin transparent mylar jacket sleeve and a flat sun screen. I have these samples with me today.

For more technical discussions of light and UV radiation, I would recommend the Canadian Conservation Institute materials[3] and Thomson's Museum Environment.[4] Connie McKay, National Archives and Records Administration, and David Airheart, at the

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[3]Raymond H. Lafontaine and Patricia A. Wood, Fluoresecent Lamps. Technical Bulletin No. 7 (Ottawa, Canada: Canadian Conservation Institute, 1982).

[4]Garry Thomson, The Museum Environment (Boston: Butterworth - Heinemann, 1986).

Conservation Analytic Lab, identified the Canadians as being leaders in the study of ultraviolet filters.

The National Museum of American History at the Smithsonian used Light Impressions catalog products in the American History archives when I was there as an intern. Using this practice as a good recommendation, I shopped in one of their archival catalogs, and found Filter-Ray UV Shields. I have a copy here. The advertisement reads, "Ultraviolet light is destroying your work! Textiles, paper, color photographs, wood, paintings, leather, and other organic materials eventually fade and deteriorate unless protected from damaging ultraviolet rays." Continuing on page 46 of their winter 1990 archival supplies catalog, "Filter-Ray UV Shields reduce damaging ultraviolet rays. Filters out 92% of the ultraviolet wave-lengths..." After reading this description, I thought we had found a way to stop the fading and deterioration process on light-exposed commercial and house-bound materials.

The Friends of ACU Library agreed to underwrite the $1500 the 480 filters would cost and we sent a purchase order to the university purchasing agent. He returned it with a request we consider Solar Screen Fluorescent Bulb Jacket, a filter jacket which wraps around the tubing and sells 500 filter jackets for $700. Their advertisement sheet reads "Invisible ultraviolet light rays from the sun cause fading, bleaching, and deterioration of displays near windows. Inside buildings stray ultraviolet radiation from fluorescent bulbs causes similar damage;... The Solar-Screen "Fade Controlled" Fluorescent Bulb Jacket is a

transparent Mylar tube engineered to fit all sizes of fluorescent bulbs...stops...ultraviolet fade from Fluorescent Bulbs."

Because of my concern that the jacket would separate in the aging process and allow light leakage, we decided to experiment to see if any immediate differences in fading of the exposed materials in the collection could be ascertained.

The four-ply multi-colored railroad boards manufactured by Beveridge Paper Company that we use for inhouse binding were placed under non-filtered, cylinder-filtered, and jacket sleeve filtered tubes. We found very little visual difference in the amount of intense fading in the three sets of papers. I have the boards with me today to illustrate the results of the experiment.

After viewing these results, we had more questions. I had read filter recommendations, as well as listened to leaders in the preservation school of thought indicate the value of protecting materials by filtering fluorescent lighting. But the test boards in my hands did not indicate the value of the filter to control fading of dyes and pigments.

At this point, I talked with several prominent conservators to gain decision-making information. After Sue Murphy, Senior Paper Conservator at the Harry Ransom Humanities Research Center at the University of Texas at Austin, saw the experimental railroad boards, she suggested we have an on-site visit by a conservator who would then write a report about the environmental factors to help us in our decision as to whether to purchase filters or not.

Dr. David Murrah, from the Southwest Collection at Texas Tech, accepted our invitation to tour the facilities. He wrote in his recommendations : "...you do have a situation that needs to be corrected. The fluorescent lighting in your rare books/reading room area is causing considerable fading to the covers and spines of your book collection, and, as you have ably demonstrated, the commercial ultra-violet filters do little to retard the damage."

After a series of phone calls to the Smithsonian Institution, National Archives and Conservation Analytic Lab, I talked with Maureen McDonald with Canadian Conservation Institute. She asked me to send to her, a 1" piece of the cylinder, jacket, and flat filters from Texas Sun Shield we had used to protect fragile papers from the photocopying rays.

The highest tolerable level for materials is 60 - 80 lux, a measurement of light similar to foot candles which equals a tungsten light level. As a rule of thumb, the same amount of damage will be produced whether there is a strong light for a short period of time or a weak light for a long period of time. An example would be 100 lux for 5 hours gives an exposure of 500 lux hours, the same fading and deterioration rate as 50 lux for 10 hours. Any type of light damages what it reaches by fading the colours of dyes and pigments. The more intense the light the greater the damage. Rates of fading decrease with time, until there comes a point when no more color is left. Then the rate of fading is zero.[5]

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[5]Ibid, p. 21.

Fading and deterioration are two separate results from light. Deterioration occurs in the fibers of the organic materials. The fibers are broken into smaller and smaller pieces until they are so short they cannot maintain the bond necessary to hold the organic material together. Whether filters control deterioration or not was not proved by on-site testing, as had been expected. A point to remember is that reactions initiated by light continue after the light as been removed.[6]

Recommendations

Ed Robinson, National Museum of American History, recommended flat sheets of filters that fit securely into the light fixture, as his first choice. As a second choice, he preferred the rigid cylinders because they last for a longer period of time and they age by changing color to a yellow which is better for reflecting light rays. He stated the jacket filters will protect for about the life of one lamp bulb. Robinson recommended the following chemical companies' filters: Dupont's Lucite; Rohn Has' Plexiglas; and Cyro's Aqua Light as well as UVA7 acrylic molding powder and UF3 filters. If buying a new fixture, lens may be made with UVA7 which gives a built-in filter protection.

On the other hand in CCI Notes on Ultraviolet Filters for

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[6]"Environmental Protection of Books and Related Materials," Preservation Leaflet Number 2, Library of Congress in Preserving America's Performing Arts : Papers from the Conference on Preservation Management for Performing Arts Collection by Barbara Cohen-Stratyner and Brigitte Kueppers, eds. (Washington, D. C. : The Theatre Library Association, 1982), 117 - 120.

Fluorescent Lamps, the Canadian Conservation Institute says two types of filters, the soft, plastic sleeve and the hard plastic tubes, are equal in efficiency and life expectancy of at least ten years. To be on the safe side, however, a one inch used sample should be sent to the Institute for testing every 3 to 5 years. The hard cylinder costs more that the thin sleeve; however, the sleeve tends to slip off the lamp after a few years.

Maureen McDonald, Assistant Conservation Scientist, Environment and Deterioration Research, Canadian Conservation Institute, analyzed the three samples of UV filters we sent her. In her written report, she recommended the buyer look for a spectral analysis of each filter. Since manufacturers' literature could be misleading, she did a spectral analysis of the samples we sent to her. I have the analysis with me if you would care to look at it.

Ms. McDonald in her letter continued: "Fading of colors on the other hand, is caused more by light than UV, so the intensity of light, and the duration of exposure are the only ways to control fading." She concluded, "the samples of Filter-Ray and Solar Screen qualify as adequate UV filters for use."

The prominent recommendation was to reduce the light exposure to the materials. Sue Murphy, Harry Ransom Humanities; and Connie McKay, National Archives; recommended low lighting with frequent exchange of materials. Ed Robinson, Smithsonian, said that the radiant energy caused by light can only be controlled by restricting light. David Murrah, Southwest Collection Texas Tech

recommended breaking the Special Collections/Archives areas down into banks of lights so they could be turned on as needed; thereby shortening the light exposure of materials. A second way he recommended was to remove some of the tubes out of the fixtures which would lower the light level. A third way would be to annex adjacent classroom space and create a room without windows for storage.

Conclusions

This study was undertaken from a user's point of view. We discovered a problem of fading and deterioration. By reading the advertisements and taking the wording at face value, we thought we had a solution. In testing the filters, we found they did not correct the problem of fading exposed materials. Recommendations given to us by leaders in the preservation field indicated removal of light to be the best procedure to eliminate fading. A second choice would be to use tungsten lighting and a third would be to keep the lux meter reading of ultraviolet rays between 60-80 with the use of filters.

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